

Self-compassion, Stress and health behaviours during the COVID-19 Crisis

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Abstract

The COVID-19 epidemic has had a debilitating effect on the health and wellbeing of the public worldwide. Restrictions on day to day activities and strict measures including the lockdown and social distancing measures were taken as a result of this pandemic, globally. The objective of this study was to examine how healthy eating behaviour, perceived behavioural control over eating and engagement in physical activity could also have been impacted by this pandemic. Stress and self-compassion are two main factors that have found to be associated with changes in health promoting behaviours from previous literature. The current study used a longitudinal design to examine the role of self-compassion in the relationship between stress and health behaviours in New Zealand residents. The results showed that stress acted as a mediating variable between self-compassion and eating behaviour during the lockdown (Alert Level 4) but this effect was not found post lockdown (Alert Level 2). However, participants who had higher levels of self-compassion were found to have better perceived behavioural control via the mediating role of stress, both during and post lockdown. This effect was not found for physical activity at both time points. This study also investigated the moderating role of self-compassion in the relationship between stress and changes in eating behaviour, perceived behavioural control and physical activity. No support was found for moderation. The findings of this study point towards the complicated nature of the interaction between these various variables. Future studies need to be undertaken to explore this interaction and use self-compassion interventions to gain a better understanding of the relationship between stress, self-compassion and health promoting behaviours.

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Self-compassion, stress and health behaviours during the COVID-19 Crisis

Overview

The COVID-19 pandemic has had a major effect on the public health globally - both physically and mentally. With the announcements of lockdowns and shutdowns across countries, a sudden unprecedented shift in lifestyle had to be adopted. As a result, recent studies have suggested that this change along with the distress caused by the pandemic may have severely impacted the mental health outcomes of the people (Rossi et al., 2020). The prevalence of PTSD, anxiety and depressive symptoms was found to have increased during the epidemic than when compared to before (Chi et al., 2020). While most of the studies are looking at the mental health outcomes of the COVID distress, it is also important to look at the changes in health behaviours. There has been widespread concern that the COVID-19 pandemic and lockdown measures may have a negative impact on health promoting behaviours (Naughton et al., 2021). Health promoting behaviours here refers to activities that help in maintaining good physical and mental health, in turn promoting overall wellbeing of an individual some of which include exercising regularly and eating healthy. Prior evidence has found that both these health behaviours are related to long-term negative health consequences such as diabetes, obesity and heart diseases (Spring, Moller & Coons, 2012). Similarly, both physical activity and eating behaviour has also found to be strongly related to mental health (Parletta et al., 2019). Therefore, more systematic research to understand health related behaviours, similar to that of mental health outcomes is needed to better understand the impact (both short term and long term) of the current global crisis affecting millions of individuals. The current study examines the changes in health promoting behaviours over the course of the lockdown and post-lockdown period in New Zealand and also examines the role of an individual difference variable, self-compassion, in the relationship between stress and changes in health promoting behaviours.

COVID-19 in the context of New Zealand

The first case of the coronavirus in New Zealand was identified on the 28th of February 2020. With an increase in community transmission post the first identified case, an Alert Level system was announced by the Prime Minister of New Zealand. This system consisted of 4 levels with Alert Level 1 being the least stringent and Alert Level 4 having the strictest lockdown measures (Ministry of Health NZ, 2021). A national state of emergency was announced on the 25th of March where NZ moved into Alert Level 4 lockdown (Palmer et al., 2020). This involved the shutting down of all schools and non-essential businesses. The level 4 lockdown lasted for a period of 33 days and ended on the 28th of April 2020 following which NZ moved down Alert levels to less stricter health measures. New Zealand followed an elimination strategy very early on and hence was able to stamp out the spread at its early stages.

Despite this, the restrictions during the lockdown may have had a psychological impact on the population. One of the only New Zealand studies that examined the psychological effects of the COVID-19 lockdown on New Zealanders was conducted by Every-Palmer et al. (2020). This study administered an online survey consisting of various psychological measures to a sample of 2010 New Zealand residents in the month of April 2020 (Alert Level 4). 30% of the participants reported an increase in psychological distress and 16% of them reported an increase in anxiety levels. This study emphasizes the need to focus on the various factors that may directly or indirectly be responsible for the psychological wellbeing of the population during the epidemic.

Changes in health promoting behaviour due to the COVID pandemic

Various research studies looking at the changes in health behaviours as a result of the COVID epidemic is emerging. One such study was conducted by Kriaucioniene et al. (2020) which explored changes in health behaviours during the COVID quarantine , mainly looking

at eating behaviour, physical activity and its association with any weight changes. An online survey using a self-administered questionnaire was conducted. 2447 Lithuanian participants took part in this study. Results obtained showed that 45.1% participants reported increased snacking behaviour during the quarantine and 60.6% reported decreased physical activity levels compared to levels prior to the COVID lockdown. On the other hand, participants also reported a decrease in consumption of carbonated drinks and fast food, but an increase in consumption of homemade fried food. This study also found that those who reported weight gain were more likely to indulge in unhealthy eating habits and decreased physical activity levels as compared to those who reported no changes in body weight.

In a similar study conducted by Ammar et al. (2020), 1000 participants from all over the globe were administered with an international online survey which was designed to understand the plausible impacts of isolation measures taken for the safety of the public. This survey consisted of various short questionnaires related to dietary changes and physical activity pre and post lockdown. Results showed that the lockdowns, leading to home confinement, negatively impacted physical activity at all levels, be it walking, moderate exercise or high intensity workouts. And an increase in sitting time by 28% had been observed. According to this study, diet was also severely impacted in terms of increased number of meals, snacking and overeating.

According to another study conducted by Robinson et al. (2020) in the UK, the lockdown that was imposed during the surge in COVID cases in the UK may have impacted eating, physical exercise and other lifestyle related behaviours. The main aim of this study was to compare the perceived changes in health promoting behaviours before the lockdown and during the lockdown. For this 2002 participants 18 years of age and above were recruited. All the data was collected during the lockdown period in the UK. Various self-reported

questionnaires were administered to measure any perceived changes in eating behaviours and physical activity during the lockdown. Results showed that most of the participants perceived negative changes in eating and exercising. They reported a decrease in healthy eating habits and lower physical activity levels during the lockdown as compared to before. However, although a majority of the participants (56%) reported frequent snacking, 23% of the sample also reported a decrease in snacking frequency. Similarly, although 40% of the participants reported a decrease in levels of physical activity during the lockdown, an equally large proportion of the sample (45%) also reported an increase in levels of physical activity. It was also observed that most of the participants who perceived negative changes in eating and weight management issues had a higher BMI. Hence, it can be said that decline in health promoting behaviours during the COVID crisis may be specific to certain sub groups of people. And therefore, it is important to identify the groups in need of support and intervention programs.

Despite the fact that many studies have found eating behaviours, physical activity and other lifestyle related behaviours to be negatively impacted during the lockdown period, there were also studies which, interestingly identified/reported an overall increase in health promoting behaviours during the home confinement period as compared to levels of the same from before COVID. For example, a Spanish study which looked at dietary changes during the lockdown found that the participants had adopted healthier eating habits in the form of greater adherence to the Mediterranean diet (which includes food such as fruits, vegetables etc.,) during the home confinement period (Rodriguez-Peres, et al., 2020).

Similarly, another cross-sectional study conducted by Blanco et al. (2020) in Spain looked at physical activity and other sedentary behaviours at two time points, before and after the state of emergency was declared. For this study, 213 college students were recruited and

administered with a set of self-report measures. The first set of data was collected after the end of year examinations (mid- January) and the second set of data was collected four weeks into the lockdown (in the month of April). During this period, strict movement restrictions were imposed by the government. The students were not allowed to step out of their homes, unless for groceries or other essential services like hospital visits. Stepping out for outdoor exercising was also prohibited in Spain at this time point. Interestingly, the results obtained showed that despite an imposed restriction on outdoor exercising, students reported more physical activity levels during the lockdown compared to when they were not faced with any environmental restrictions. Therefore, more research focusing on this complex interaction between health behaviours and environmental factors may be useful in addressing the different mental health outcomes arising from various lifestyle behaviours.

Stress and Health behaviours

Stress has been identified as having a major influence on health and wellbeing. Stress has been widely defined as one in which the demands of the situation threaten to exceed the resources of the individual (Lazarus & Folkman, 1984). Stressors can be both biological and psychosocial. And these stressors can have biological, behavioural and psychological effects (Schneiderman, Ironson & Siegel, 2005). Focusing on the behavioural effects of stress, it has been identified that stress, through indirect pathways could have a major impact on health via changes in health behaviours (Von ah et al., 2004).

Stress and eating behaviour

Exposure to stress has been found to be related to an increase in unhealthy eating behaviours by an increase in food intake, i.e., higher levels of stress can be correlated with an increase in snacking behaviours and overall food intake (Oliver & Wardle, 1999). This increase in appetite and overeating could be due to an increased cortisol production that arises from

stress – both acute and chronic (Adam & Epel, 2007). On the other hand, a few studies have also found that increased levels of stress could potentially suppress/decrease one's appetite thereby reducing food intake (e.g., Popper et al., 1989).

Hsu & Raposa, (2019) conducted a diary study to investigate the role of stress on eating behaviours amongst adolescents. The main aim of their study was to identify if daily perceived stress was associated with problematic eating behaviours. This was done through the maintenance of a daily diary, which hoped to identify day to day changes in stress and negative behavioural responses more efficiently. For this study, 88 participants were recruited and were asked to complete daily diary surveys which consisted of measures related to daily stress, negative affect and eating behaviours for seven consecutive days. Between-subject results showed that participants who reported an increased number of day to day negative experiences also reported an increase in consumption of food and cravings. Within- subject changes in day to day levels of stress was also found to be correlated with eating behaviour. These findings suggested that increased levels of day to day stress was correlated with an increase in the likelihood of over consumption of food.

Similarly, in another study that looked at stress driven eating behaviours and its effects on obesity, overweight and health behaviours in a sample of adolescents ($N = 3598$ girls and 3347 boys), the overall results indicated that stress related eating behaviours, such as frequent consumption of sodas, chocolate and alcohol was more prevalent among the girls with 43% of them indulging in such behaviours as compared to the boys (15%). It was also observed that stress eaters had higher risks of obesity or being overweight (Jaaskelainen et al., 2014).

The declaration of a worldwide public health emergency owing to COVID-19 has led to major stress and anxiety globally. Health related worries, loneliness from social isolation and financial insecurity may have a major impact on psychological distress (Brooks et al.,

2020). This distress may in turn impact one's level of engagement in health promoting behaviours.

Luo et al. (2020) looked at the factors responsible for changes in health behaviours during the pandemic through their cross-sectional study. 2449 participants were recruited for this study when COVID was at its peak in China. They were administered with an online survey consisting of various measures. Analyses showed that health risk stress was negatively correlated with health behaviours. Health risk stress refers to the possible effect of one's perception of stress on health. This study also found health behaviours to be positively associated with positive perceptions of interventions, thereby suggesting the importance of focusing on public health interventions and behavioural skills to help reduce stress and anxiety associated with the COVID epidemic.

Stress and physical activity

Various studies have also looked at the relationship between stress and engagement in physical activity. A systematic review done by Kolehmainen & Sinha (2013) looked at 168 studies that investigated the role of stress on physical activity (PA) and exercise. Most of the studies reviewed (79%) found that stress was inversely related to physical activity, i.e., increased levels of stress may lead to decreased physical exercise and increase the possibility of adopting a sedentary lifestyle. For example, Steptoe and colleagues (1996) examined the impact of examination stress on health promoting behaviours, particularly looking at physical activity changes among 180 college students. The participants were divided into two groups (an exam stress group and a control group). They were assessed at two time points (baseline and 2 weeks post examination/equivalent time for the control group). Results obtained showed a significant decrease in physical activity levels between the baseline and 2 weeks into the exam in the exam stress group but did not show any significant differences in the control group.

Research studies looking at the association between stress and physical activity during the lockdown and post-lockdown periods owing to the COVID epidemic is also emerging. In a study conducted by Stanton et al. (2020) in Australia, 1491 participants were administered with an online survey to investigate the role of stress on health behaviours. The results showed that those who had higher levels of stress reported negative effects on physical activity.

Self-compassion

Some people will experience more stress than others in relation to the COVID-19 pandemic and for some people stress will have a stronger impact on their health behaviours compared to others. A promising individual difference variable to look at in this context is self-compassion. Self-compassion is a concept that originated from Buddhist meditation and has gained great popularity in the practice of psychology and research over the past years. Kristen Neff was the first to have scientifically pioneered the concept of self-compassion and developed a scale to measure self-compassion objectively (Neff, 2003a). She defined self-compassion as taking a kind, compassionate, and accepting stance toward oneself during difficult times (Neff, 2003b). According to Neff, self-compassion consists of three core components: self-kindness instead of self-judgement, common humanity instead of isolation and mindfulness instead of over-identification. Self-kindness involves being non-judgemental and caring towards oneself when faced with experiences involving failure and suffering or pain. Common humanity involves recognizing that it is okay to make mistakes and that difficulties is part of the shared human experience (something that happens to everybody and not only “me”). And lastly, mindfulness is about being fully aware of one’s emotions and what one is truly experiencing. Self-compassion has been found to be related to a wide range of positive psychological outcomes, such as lower rates of anxiety and depression and higher rates of well-being (e.g., Barnard & Curry, 2011; Macbeth & Gumley, 2012).

Self-compassion, stress, and health behaviours

Growing evidence, through various studies have found that self-compassion has a major impact/plays a potential role on one's physical health- through increase in health promoting behaviours and decrease in health risk behaviours. A recent meta-analysis study done by Phillips & Hine (2019) explored the relationship between self-compassion, health behaviour and physical health. This study hypothesized that self-compassion is a positive predictor of health behaviour and physical health. For this, a total of 94 peer reviewed articles were analysed after a screening process. A positive relationship was found between self-compassion and physical health and self-compassion and health behaviours (although not equally strong for all age groups and all types of health behaviours). A moderation analysis based on age groups also revealed that self-compassion was related to better physical health in older participants when compared to younger participants. The findings of this study also suggest that self-compassion may help reduce unhealthy eating more than it can help increase healthy eating.

In another meta-analysis study conducted by Sirois, Kitner & Hirsch (2015) which involved a total of more than 3000 participants from over 15 samples, it was observed that self-compassion was positively associated with health promoting behaviours such as exercising regularly, healthy eating and sleep patterns but also stress management. Homan and Sirois (2017) tested a mediation model to understand the interaction between self-compassion, stress and health behaviours. Their study hypothesized that both stress and health promoting behaviours act as mediating variables in the relationship between self-compassion and physical health. This would mean that an increase in self-compassion would lead to a decrease in levels of stress and an increase in health promoting behaviours thereby improving overall physical health. For this, 176 participants with an average age of 31 years were recruited and completed online questionnaires. The results obtained revealed that those people who were more self-compassionate reported lower levels of stress and more frequent health behaviours. Mediation

analyses showed that perceived stress and the practice of health behaviours mediated the relationship between self-compassion and self-reported physical health (Homan & Sirois, 2017).

Similarly, another study conducted by Li et al. (2019) whose main aim was to examine the relationship between state self-compassion (daily self-compassion that varies from day to day based on the state of the individual on that particular day) and health promoting behaviours and identify if state self-compassion had the same effect as that of trait self-compassion and if stress mediated this relationship. 89 Chinese employees were recruited for this study. They were required to fill out the trait Self-compassion Scale and were also required to complete daily diaries of state self-compassion, perceived stress and health promoting behaviours (both exercising and eating behaviour). Mediation analyses revealed that daily self-compassion reduced perceived stress and thereby positively predict healthy eating. But this effect was not found for physical activity. Self-compassion did not have a significant association with exercise behaviour.

Most studies discussed so far suggest a mediation model linking self-compassion to health behaviours via stress. This assumes that individuals with higher levels of self-compassion experience lower levels of stress, which in turn has an effect on their eating behaviour and physical activity. However, it is also possible that individuals with higher levels of self-compassion cope differently with stress, there by pointing to a moderating role of self-compassion. Moderating variables are those variables that can impact the association between the dependent variable and the independent variable by causing an interaction effect.

A few studies have examined the moderating role of self-compassion. In a 2-week diary study, self-compassion was found to moderate the relationship between stress and sleep in a sample of university students: those who had higher self-compassion levels were able to sleep better after a stressful day as compared to those with lower self-compassion levels (Hu, Wang,

Sun, Arteta-Garcia, & Purol, 2018). In another study conducted by Abdollahi, Taheri and Allen (2020), which investigated the role of self-compassion on the relationship between perceived stress and self-care behaviours such as healthy eating behaviour and physical activity in breast cancer patients, they found that self-compassion had a moderating effect on the relationship between perceived stress and self-care behaviours. People with higher levels of self-compassion indulge in better health behaviours even when they experience high stress levels as compared to those with lower self-compassion. Neff, Kirkpatrick and Rude (2007) found that high self-compassion was also related to lower levels of anxiety during an ego-threat stressor in a laboratory setting.

Finally, Sullivan, Kerr & Kuijer (under review) found that self-compassion moderated the relationship between stress and weight change in first year students. They found that students with low levels of self-compassion who were experiencing high levels of stress during their first year at university increased in weight. The link between stress and weight change was not observed in students with average or high levels of self-compassion. These studies suggest that self-compassion may buffer the negative effects of stress. A person with high self-compassion may be better able to self-regulate and cope with stress. Terry & Leary (2011) studied the importance of self-regulation in achieving health promoting behaviours. Their study showed that an increase in levels of self-compassion facilitated self-regulating behaviours (goal setting, goal striving etc.) which in turn positively influenced health promoting behaviours.

The Current Study

Previous research has suggested that stress and self-compassion have various positive effects on health outcomes through an increased engagement in health promoting behaviours (Sirois & Homan, 2017). There is also growing research on changes in health behaviours during the COVID crisis.

The first aim of the present study is to document changes in eating behaviour, difficulty maintaining a healthy diet (perceived behavioural control over eating) and physical activity from before (pre-COVID) to during and post lockdown. Participants in this study completed a set of questionnaires at three time points. The first set of questionnaires was administered late 2019 prior to the pandemic. The second set was completed during lockdown (4 weeks into Alert Level 4) and the third set of questionnaires were administered post-lockdown (during Alert Level 2). To my knowledge, this is the first study that has access to data collected before the start of the pandemic and one of few studies to assess eating behaviour and physical activity at more than one time point during the COVID pandemic. All of the other studies discussed above, are cross-sectional single time point studies using retrospective assessment of pre-pandemic behaviours.

The second aim of this study is to examine the link between self-compassion, stress and changes in eating behaviour, perceived behavioural control and physical activity. Based on previous research I expect stress to be significantly correlated with eating behaviour, perceived behavioural control and physical activity: those who score high on levels of stress will indulge in less healthy eating practices, decreased perceived behavioural control and decreased physical activity. I expect self-compassion to be negatively related to stress and positively related to healthy eating, perceived behavioural control over eating, and physical activity. This study will also investigate the role of self-compassion in the link between stress and health behaviours by looking at both mediation (self-compassion is related to lower levels of stress which in turn is related to better health behaviours) and moderation (the link between stress and health behaviour varies as a function of self-compassion) models.

Method

Participants and Procedure

Participants were New Zealand residents, 18 years of age or older who were initially recruited for two online studies done by my primary supervisor. Participants in these studies completed questionnaires over two different time frames, but all completed their final questionnaire between 28 August – 27 November 2019 (before the beginning of the global COVID-19 pandemic; referred to as Time 0 in this thesis). Participants for both studies were recruited through various means - flyers in letter boxes, letters posted to postal addresses, and online through social media (community groups) and the message board of an online auction website. At the conclusion of these studies, participants were asked if they would be interested in participating in future research (98% were; $N=310$). These individuals were then recontacted in the week starting 20 April 2020 (Time 1: 4 weeks into Alert Level 4 lockdown) and were invited to participate in the current study.

One hundred and ninety-two participants agreed to participate and completed the first COVID-19 questionnaire (62% response rate). A second COVID-19 questionnaire was emailed to participants in the week starting 1 June (Time 2; during Alert Level 2) and was completed by 163 participants. Both the original studies (pre-COVID) and the current study (post-COVID) were reviewed and approved by the human ethics committee of the University of Canterbury. I examined whether participants who agreed to participate in the current study and those who did not differed in terms of age and sex. Participants who took part in the current study were significantly older ($M = 48.53$, $SD = 14.95$) compared to participants who did not take part ($M = 44.65$, $SD = 13.18$), $t(308) = 2.31$, $p < .05$. There were no significant differences between those who took part and those who did not in terms of sex, $\chi^2 = 2.54$, $p > .05$. Table 1 shows the demographic characteristics of the 192 participants who took part in the current study. It can be seen that the participants were primarily female and NZ European. Most of the

participants in this study also received formal education and were married. Only 2.6% of the participants were unemployed.

Table 1
Sample Demographics (N = 192)

		Mean or <i>n</i> (<i>SD</i> or %)
Age		48.53 (14.95)
Sex		
	Female	159 (82.8)
	Male	32 (16.7)
	Other	1 (0.5)
Ethnicity ¹		
	NZ European	186 (96.8)
	NZ Maori	10 (5.2)
	Other	3 (1.5)
Level of Education		
	No formal education	9 (4.7)
	Secondary school	51 (26.5)
	Post school	47 (24.4)
	University degree	85 (44.2)
Marital Status		
	Married	131 (68.2)
	Widowed	3 (1.5)
	Divorced/Separated	39 (20.3)
	Unmarried	19 (9.9)
Employment status (at Time 1)		
	Full-time job	79 (41.1)
	Part-time job	49 (25.5)
	Unemployed	5 (2.6)
	Student	11 (5.7)
	Others	67 (34.9)

Note. ¹participants could identify with more than one ethnic group

Measures

The measures used in the current study are described below.

Self-Compassion (Time 0). Self-compassion was measured using the Self-Compassion Scale-Short Form (SCS-SF; Raes et.al., 2011). It is a 12-item scale derived from the original 26-item Self-Compassion Scale developed by Neff (2003a). The original Self-Compassion

Scale consists of 6 factors. The 3 core components include self-kindness, common humanity and mindfulness. The SCS-SF was derived from this to reduce the exhaustive process of completing a lengthy questionnaire. Some of the items include, “I try to see my failings as part of the human condition” and “When I’m going through a very hard time, I give myself the caring and tenderness in need” (see Appendix C). They are rated on a scale ranging from 1 (*almost never*) to 5 (*almost always*). The items that were negatively worded in this scale were reverse coded and these scores were then computed to form an overall self-compassion score. An increase in this score indicates higher levels of self-compassion. Cronbach’s Alpha for the Self-Compassion Short-Form Scale in this study was found to be .76, indicating good reliability of the scale.

Eating behaviour (Time 0, 1, 2). Eating behaviour was assessed with a self-report questionnaire asking participants to recall their eating behaviour over a specified time period. The measure is based on a scale developed by Baker, Little and Brownell (2003; see Kuijjer & Boyce, 2015; Kuijjer et al., 2015). The time frame at Time 0 differed slightly between the two parent studies (2 weeks in one study and 3 weeks in the other study). At Time 1 and Time 2, a recall period of 4 weeks was used. Sample items are: “In the past X [specified time frame] weeks, on how many days per week did you: eat healthy amounts of food? sweet snack foods, overeat (kept eating while you were already full)?” (see full scale in Appendix D). The items are rated on a scale ranging from 1 (*everyday*) to 5 (*less than once a week*). The positively worded items in this scale were reverse scored. The five items were summed to form an overall score. A higher overall score indicates more healthy eating behaviour. Cronbach’s Alpha for the Eating behaviour scale in this study was found to be .80 at Time 0, and .79 at Time 1 and Time 2.

Perceived changes in eating were also assessed. For this, participants were asked at Time 1 and Time 2, if their eating behaviour had been different from normal (*I normally eat less healthy / I normally eat more health / about the same*) (see Appendix D).

Perceived behavioural control over healthy eating (Time 0, 1, 2). Perceived behavioural control (PBC) refers to a personal evaluation of how easy or difficult it is to perform certain behaviours (Ajzen, 1991). A five-item scale was used to measure PBC in the current study (based on Armitage, 2005; see Kuijer & Boyce, 2015). Sample items are: “How difficult or easy are the following things for you at the moment?: Eating in a balanced way with lots of fruit and vegetables, eating moderate amounts of food and stopping when I am full, staying away from sweet snacks” (for full scale see Appendix D). The items are rated on a scale ranging from 1 (*very difficult*) to 5 (*very easy*). Some of the items in this scale were summed to form an overall perceived behavioural control (PBC) score. A higher overall score indicates higher perceived behavioural control. Cronbach’s Alpha for the PBC scale was found to be .70 at Time 0 and Time 2 and .66 at Time 1.

Physical activity (Time 0, 1, 2). Physical activity was assessed with two items (see Appendix D) assessing on how many days in the past 7 days participants had engaged in vigorous-intensity activity and moderate-intensity activity (adapted from New Zealand Health Survey; Ministry of Health). Both these items were summed to get an overall score for physical activity and these items are rated on a scale ranging from 0 (being zero days) to 7 (being 7 days). Cronbach’s alpha for this was found to be .76 at Time 0 and .67 and .74 at Time 1 and Time 2 respectively.

Perceived changes in physical activity were also assessed. For this, participants were asked at Time 1 and Time 2 if their physical activity levels had been different from normal (*I am normally less physically active / I am normally more physically active / about the same*) (see Appendix D).

Stress (Time 1, 2). At both time points, participants were asked to rate their levels of stress on a 10-point scale ranging from 1 (*not stressful at all*) to 10 (*extremely stressful*) (Parks et al., 2012).

Analyses

All the analyses were done using SPSS version 26. As a part of preliminary analysis, data was cleaned and plots were examined for outliers. The demographics of participants who completed Time 0, 1 and 2 were also computed.

After this, subscales were calculated for multi-item scales. Some items were recoded and computed into these subscales. Cronbach's alphas were then calculated for each of the scales to determine its reliability. Means and standard deviation scores were computed for each of these multi-item scales. Distributions were also examined for skewness and kurtosis. Repeated measures ANOVA was performed to examine the changes in eating behaviour, perceived behavioural control (PBC) and physical activity from Time 0 to Time 2. Frequencies for self-reported perceived changes in eating behaviour and physical activity were examined to identify any differences across Time 1 and Time 2.

Next, correlation matrices were computed for all the variables in this study in order to explore the relationships between the various variables to be able to do further analyses. One-way ANOVA analyses were carried out in order to examine whether those who reported change (increase or decrease) or no change in eating behaviour and physical activity differ in regards to self-compassion.

Mediation analyses were conducted to determine whether stress acted as a mediating variable in the relationship between self-compassion and eating behaviour, PBC and physical activity at Time 1 and Time 2, respectively. This was performed using the PROCESS macro for SPSS (Hayes, 2019). Pre-COVID eating behaviour, PBC and physical activity were added

as covariates in the model. Self-compassion was the independent variable (X) in the model. The analyses were first done with Time 1 eating behaviour, PBC and physical activity, respectively, as the dependent variable and Time 1 stress as the mediator (M). The analyses were then repeated with Time 2 eating behaviour, PBC and physical activity, respectively, as the dependent variable and Time 2 stress as the mediator (M).

Moderation analyses were conducted to identify whether self-compassion moderated the relationship between stress, and eating behaviour, PBC and physical activity at Time 1 and Time 2, respectively. Hierarchical multiple regression analyses were used for this purpose. The variables stress and self-compassion were centred to avoid multicollinearity. In the analyses with Time 1 health variables as the dependent variable, the Time 0 health behaviour variable was entered in Step 1 as a covariate. Stress (Time 1) and Self-compassion (Time 0) were added in Step 2 and the interaction term (Stress x Self-compassion) in Step 3. As with the mediation analyses described above, the analyses were repeated with Time 2 health variables as the dependent variable and Time 2 Stress as the predictor.

Results

Measured change in health behaviour over time

Repeated measures ANOVAs were done to examine changes in eating behaviour, perceived behavioural control (PBC) and physical activity across the three time points (pre-pandemic – Time 0, during Alert Level 4 lockdown – Time 1, and during Alert Level 2, post-lockdown – Time 2). The findings are presented in Table 2.

Table 2
Measured differences in health behaviours over time

		<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>	Partial η^2
Eating Behaviour	Time 0	3.71 ^a	0.89	3.37	0.042	.021
	Time 1	3.85 ^b	0.80			
	Time 2	3.77 ^{ab}	0.86			
PBC	Time 0	3.76	0.88	0.23	0.769	.001
	Time 1	3.73	0.78			
	Time 2	3.72	0.86			
Physical Activity	Time 0	2.94 ^a	2.04	10.32	<.001	.060
	Time 1	3.54 ^b	2.13			
	Time 2	3.01 ^a	1.92			

Note: Green-house-Geisser tests of within-subjects effects are reported. Means with different superscripts differ significantly at $p < .05$ (post-hoc pairwise comparisons)

Mauchly's test of sphericity was significant for each dependent variable, hence Greenhouse-Geisser tests of within-subjects effects are reported in the table. Table 2 shows there was a significant effect over time for eating behaviour ($p = 0.042$) and physical activity ($p < .001$), but not for PBC ($p = 0.769$). Post-hoc pairwise comparisons revealed that participants reported slightly healthier eating behaviour during lockdown (Time 1) as compared to pre-lockdown (Time 0). At Time 2 (post-lockdown) eating behaviour did not differ significantly from either Time 0 or Time 1. On the other hand, Post-hoc pairwise comparisons showed no significant difference across the three time points for perceived behavioural control. Post-hoc pairwise comparisons for physical activity showed that

participants reported an increase in physical activity during lockdown (Time 1) as compared to pre-lockdown (Time 0). On the contrary, at Time 2, participants reported a significant decrease in physical activity as compared to its levels during lockdown (Time 1) but did not differ significantly from Time 0.

Self-reported perceived change

Participants' perceptions of changes in eating behaviour and physical activity post-COVID when compared to their engagement in these behaviours pre-COVID were also recorded. Table 3 shows that at Time 1 (4 weeks into Alert Level 4 lockdown), 13.5% of the participants reported that they normally ate less healthy, 33.9% reported that they normally ate healthier and 52.6% of the participants said that they observed no change in eating behaviour during and post lockdown as compared to before. On the other hand, when participants ($n = 163$) were asked the same questions at Time 2, the number of participants reporting no change had increased (67.5%) and the number of participants reporting that they normally ate healthier had decreased (21.5%).

Similarly, when participants were asked about their perceptions of any changes in physical activity at Time 1, 28.6% of them reported that they were normally less active, 37.0% said that they were normally more active and 34.4% reported that they observed no change in physical activity during and post lockdown as compared to before. At Time 2 ($n = 162$), the number of participants reporting no change in physical activity had increased (47.5%) and the number of participants reporting that they were normally less physically active had decreased (13.0%).

Table 3
Self-reported change in eating behaviour and physical activity

		<i>n</i>	<i>%</i>
Changes in eating behaviour			
Time 1	Normally eat less healthy	26	13.5
	Normally eat more healthy	65	33.9
	About the same	101	52.6
Time 2	Normally eat less healthy	18	11.0
	Normally eat more healthy	35	21.5
	About the same	110	67.5
Changes in physical activity			
Time 1	Normally less physically active	55	28.6
	Normally more physically active	71	37.0
	About the same	66	34.4
Time 2	Normally less physically active	21	13.0
	Normally more physically active	64	39.5
	About the same	77	47.5

Note. Time 1: *n* = 192; Time 2: *n* = 163 for eating behaviour & *n* = 162 for physical activity.

Self-compassion, stress and health behaviours

Correlations between all variables in the study are presented in Table 4. Stress at all time points was found to be negatively correlated with self-compassion. That is, those with higher levels of self-compassion reported lower levels of stress. In contrast, self-compassion was positively correlated with eating behaviour, physical activity and perceived behavioural control in such a way that those with higher levels of self-compassion demonstrated healthier eating behaviours, more physical activity and higher levels of perceived behavioural control at all time points. On the other hand, stress at all time points had a negative correlation with eating behaviour. Those with higher levels of stress reported lesser healthy eating behaviour. Similarly, stress was also found to be negatively correlated with physical activity (PA) and PBC at all time points.

Table 4
Correlation Matrix: all variables Time 0 to Time2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Self compassionT0	1													
2 PBC Time 0	.29**	1												
3 PBC Time 1	.22**	.58**	1											
4 PBC Time 2	.30**	.61**	.73**	1										
5 PA Time 0	.18**	.27**	.18**	.16*	1									
6 PA Time 1	.14*	.30**	.36**	.23**	.51**	1								
7 PA Time 2	.15*	.23**	.31**	.29**	.58**	.69**	1							
8 EB Time 0	.28**	.64**	.43**	.51**	.31**	.24**	.28**	1						
9 EB Time 1	.27**	.52**	.63**	.57**	.28**	.24**	.30**	.59**	1					
10 EB Time 2	.28**	.54**	.56**	.65**	.23**	.21**	.33**	.70**	.79**	1	1			
11 Stress Time 1	-.30**	-.19**	-.41**	-.29**	-.06	-.13	-.09	-.19**	-.39**	-.32**	.35**	1		
12 Stress Time 2	-.26**	-.11	-.32**	-.36**	-.11	-.12	-.16*	-.29**	-.37**	-.35**	.51**	.45**	1	

Note. PBC refers to perceived behavioural control, PA refers to physical activity and EB is eating behaviour

* $p < .05$.

** $p < .01$.

To examine whether those who reported change (increase or decrease) or no change in eating behaviour and physical activity differ in regards to self-compassion, one-way ANOVA analyses were carried out. Results showed that there is a statistically significant difference for self-reported change in eating behaviour at both Time 1 and Time 2 (Table 5). A Tukey post hoc test revealed that those participants who had higher levels of self-compassion were found to be less likely to report any change in eating behaviour when compared to the participants with lower levels of self-compassion at both Time 1 and Time 2. On the contrary, no significant difference was found in self-reported changes in physical activity from Time 1 to Time 2.

Table 5
Self-reported change and differences in self-compassion over time

	Self-compassion		<i>F</i>	<i>p</i>	Part. eta ²
	<i>M</i>	<i>SD</i>			
Changes in eating behaviour Time 1					
Normally eat less healthy	3.04 ^a	0.75	8.10	<.001	.079
Normally eat more healthy	2.96 ^a	0.65			
About the same	3.38 ^b	0.68			
Changes in eating behaviour Time 2					
Normally eat less healthy	3.03 ^a	0.75	4.72	0.010	.056
Normally eat more healthy	2.96 ^a	0.66			
About the same	3.33 ^b	0.67			
Changes in physical activity Time 1					
Normally less active	3.24	0.68	0.30	0.745	.003
Normally more active	3.18	0.65			
About the same	3.14	0.77			
Changes in physical activity Time 2					
Normally less active	3.08	0.62	1.27	0.282	.016
Normally more active	3.17	0.71			
About the same	3.31	0.67			

Note: Means with different superscripts differ significantly at $p < .05$.

The Mediating role of Stress

In order to identify whether stress acted as a mediating variable in the relationship between self-compassion and eating behaviour, PBC and physical activity at Time 1 and Time 2 (whilst controlling for pre-COVID eating behaviour, PBC and physical activity, respectively), mediation analyses were conducted. The results are presented in Table 6. Total effects, Indirect effects and Direct effects are significant when the 95% confidence interval does not include zero.

Table 6 shows that in all analyses and at both time points, self-compassion was a significant predictor of stress (the 'a' path in Table 6). Thus, individuals with higher levels of self-compassion reported lower levels of stress during lockdown (Time 1) and post-lockdown (Table 2). Table 6 further shows that stress was found to have a significant negative effect on both eating behaviour and perceived behavioural control at both Time 1 and Time 2, respectively. But this effect was not found for physical activity (the 'b' path in Table 6).

There was a significant indirect effect of self-compassion (T0) on eating behaviour (T1) when stress (T1) was added into the model as a mediating variable (i.e., the 95% confidence interval did not include 0). This indirect effect suggests that higher self-compassion levels are related to lower stress levels during lockdown, which in turn is related to healthier eating behaviour at Time 1. The indirect effect did not reach significance at Time 2, even though both the 'a' path and the 'b' path were significant. The total effect of the model was significant at Time 2, but not at Time 1.

Self-compassion was also found to have a significant indirect effect on perceived behavioural control via the mediating role of stress at both Time 1 and Time 2, respectively. That is, higher self-compassion lead to a decrease in stress levels there by leading to better perceived behavioural control at both time points. The total effect of the model was significant at Time 2, but not at Time 1.

The indirect effect between self-compassion and physical activity when stress was added as a mediating variable was not significant at both Time 1 and Time 2.

Table 6
Mediation effect of Stress between Self-compassion and Health Behaviours

	Total Effect		Direct Effect		Indirect Effect		a path	b path
	b	95% CI	b	95% CI	b	95% CI	(IV – M)	(M – DV)
EB T1 (DV) SC T0 (IV) Stress T1 (M)	0.14	[-.00, .27]	0.05	[-.08, .18]	0.09	[.03, .15]	-.86***	-.10***
EB T2 (DV) SC T0 (IV) Stress T2 (M)	0.15	[<.01, .29]	0.11	[-.02, .25]	0.03	[-.00, .08]	-.63*	-.06*
PBC T1 (DV) SC T0 (IV) Stress T1 (M)	0.07	[-.07, .20]	-0.03	[-.16, .10]	0.10	[.04, .16]	-.90***	-.12***
PBC T2 (DV) SC T0 (IV) Stress T2 (M)	0.19	[.03, .35]	0.11	[-.04, .25]	0.09	[.02, .17]	-.80**	-.11***
PA T1 (DV) SC T0 (IV) Stress T1 (M)	0.15	[-.22, .52]	0.07	[-.32, .45]	0.08	[-.04, .23]	-.95***	-.08
PA T2 (DV) SC T0 (IV) Stress T2 (M)	0.09	[-.26, .44]	0.04	[-.33, .40]	0.06	[-.04, .18]	-.84***	-.07

Note. IV = independent variable, DV = dependent variable, M = mediator variable; SC = self-compassion, EB = eating behaviour, PBC = perceived behavioural control, PA = physical activity; All analyses controlled for T0 health behaviour variable; * $p < .05$, ** $p < .01$, *** $p < .001$

The Moderating role of self-compassion

In order to examine whether self-compassion acts as a moderating variable on the relationship between stress and health promoting behaviours, moderation analyses were conducted. The results are reported in Table 7. The main effects of stress on eating behaviour, and perceived behavioural control at both Time 1 and Time 2 respectively, whilst controlling for their scores pre-COVID, were significant. But stress was not found to have a significant direct effect on physical activity at both time points. The main effects of self-compassion on eating behaviour, perceived behavioural control and physical activity at both Time 1 and Time 2, whilst controlling for their baseline scores, were not significant. On adding the interaction term between self-compassion and stress into the model for eating behavior, the result obtained was not significant at both Time 1 and Time 2. Similar results were found for both PBC and physical activity as well. No support for moderation was found at both time points.

Table 7
Hierarchical regression analyses to examine moderation

	R ² cha	B	SE	Beta	t	Sig.
EB Time 1 (DV)						
1 EB Time 0		.472	.052	.527	9.08	.000
2 SC Time 0	.355	.046	.069	.040	0.67	.503
Stress Time 1	.087	-.105	.021	-.288	-4.95	.000
3 SC Time 0 x Stress Time 1	.000	.001	.027	.001	0.02	.983
EB Time 2 (DV)						
1 EB Time 0		.618	.057	.639	10.89	.000
2 SC Time 0	.494	.112	.072	.091	1.57	.118
Stress Time 2	.032	-.057	.023	-.146	-2.46	.015
3 SC Time 0 x Stress Time 2	.002	.022	.031	.040	0.72	.474
PBC Time 1 (DV)						
1 PBC Time 0		.457	.050	.528	9.11	.000
2 SC Time 0	.337	-.027	.069	-.023	-0.38	.699
Stress Time 1	.096	-.116	.021	-.320	-5.52	.000
3 SC Time 0 x Stress Time 1	.004	.033	.027	.066	1.20	.230
PBC Time 2 (DV)						
1 PBC Time 0		.560	.059	.576	9.53	.000
2 SC Time 0	.375	.097	.077	.078	1.27	.207
Stress Time 2	.097	-.114	.024	-.290	-4.82	.000
3 SC Time 0 x Stress Time 2	.006	.046	.033	.082	1.39	.166
PA Time 1 (DV)						
1 PA Time 0		.547	.069	.507	7.69	.000
2 SC Time 0	.265	.055	.199	.018	0.27	.784
Stress Time 1	.009	-.085	.062	-.090	-1.37	.171
3 SC Time 0 x Stress Time 1	.002	-.057	.081	-.044	-0.70	.482
PA Time 2 (DV)						
1 PA Time 0		.535	.061	.574	8.79	.000
2 SC Time 0	.355	.018	.186	.007	0.09	.921
Stress Time 2	.007	-.081	.058	-.093	-1.39	.164
3 SC Time 0 x Stress Time 2	.010	.130	.081	.103	1.60	.110

Note. DV refers to the dependent variable. Numbers 1, 2 & 3 is the order of addition of variables into the model. SC denotes self-compassion, EB denotes eating behaviour, PBC is perceived behavioural control and PA is physical activity. Regression estimates of the final model (step 4) are presented.

Discussion

The main aim of the present study was to examine the changes in eating behaviour, perceived behavioural control and physical activity from before COVID-19 to during Alert Level 4 lockdown and post lockdown in a sample of New Zealand residents. This study also sought to examine the link between self-compassion, stress and changes in eating behaviour PBC and physical activity. The mediating role of stress in the relationship between self-compassion and changes in eating behaviour, PBC and physical activity was investigated. Self-compassion as a potential moderating variable in the relationship between stress and changes in eating behaviour, PBC and physical activity was also examined.

Changes in eating behaviour, perceived behavioural control and physical activity

This study found that there was a positive change in eating behaviour during the Alert Level 4 lockdown (Time 1) when compared to before. It was observed that on average participants engaged in slightly healthier eating during the lockdown. But this change was small and did not last. The eating behaviour of the participants, when measured post lockdown, during Alert Level 2, did not differ significantly from their baseline levels. So, although our findings suggest a temporary positive change in eating behaviour during the lockdown, this change is small and is also not reflected in how difficult people find it to maintain a healthy diet. This is interesting because other studies looking at changes in health behaviours during the COVID-19 pandemic reported the opposite. For example, the study conducted by Ammar et.al, (2020) found a decrease in healthy eating behaviour and an overall increase in snacking behaviour and over eating during the lockdown. Similarly, the study conducted by Kriaucioniene et al, (2020) also found that 45.1% of the participants reported an increase in snacking behaviour during the lockdown.

When participants were asked about their own perceptions of change in eating behaviour during lockdown the picture was slightly different: although most participants did not perceive much change in their eating behaviour, more participants reported negative change (34%) than positive change (14%), in line with findings from a study by Poelman et al., (2020). Over time (at Time 2), the percentage of participants reporting negative change decreased. Perhaps people have a tendency to perceive the lockdown to have had negative effects on their health behaviours but this may not necessarily be the case. Overall, the current study did not find much support for large negative changes as suggested by other studies, in both eating and perceived control over eating. Even though some people perceived negative changes in eating, by and large, there is not much evidence for large negative change.

Various factors, both individual and environmental, could have influenced the findings of the current study: The country the participants were from, the severity of the pandemic at that time point, the differences in guidelines that the population was required to adhere to, the level of strictness in terms of restricted movement during the lockdown and social distancing measures.

For example, in New Zealand, though strict lockdown measures were followed during Alert level 4, the number of cases of the corona virus were not as much when compared to other countries that were far worse hit. In some countries, even access to super markets were limited. This was not the case in New Zealand. There were a number of restrictions and social distancing rules to be followed in supermarkets but people were able to access them at their convenience. These factors could have played a huge role in the extent to which changes in eating behaviour were observed during the lockdown and post lockdown. For example, stress could have had severe negative effects on eating, in the form of over-eating and increased snacking. So, it could be possible that, people from the countries where the number of COVID cases were higher, were more prone to stress which indirectly causes an increase in unhealthy

eating behaviour when compared to the people in New Zealand, who did not seem to show large negative changes in eating behaviour. Hence, it is important for future research studies in this area to take all these factors into account while looking at health promoting behaviours during a Pandemic.

In the case of physical activity, it was observed that participants showed an increase in physical activity levels during the lockdown. Again, this change was short-lived because a drop in physical activity levels were found post lockdown, when the environmental restrictions were not as stringent. Engagement in physical activity post lockdown did not differ significantly from levels prior to the lockdown. These findings are consistent with a few other studies. For example, the results from a study conducted by Blanco et. al (2020) at two time points- pre and post lockdown in Spain showed that despite an imposed restriction on outdoor exercising, students reported more physical activity levels during the lockdown compared to when they were not faced with any environmental restrictions.

However, most studies found the opposite: a drop in physical activity levels during lockdown. For example, the study conducted by Bourdas & Zacharakis (2020) in Greece, found that physical activity levels of the participants had significantly dropped during the lockdown period and inactivity was found to have increased during this period.

Again, these differences in findings between studies could be attributed to various environmental factors. The guidelines with respect to movement during the lockdowns varied between countries. In some countries, even going on walks or runs were not permitted as per the lockdown restrictions. In New Zealand, though strict measures were taken in terms of social distancing, exercising and going on walks either alone or with someone from the same bubble were permitted. Another reason for the increase in physical activity levels found in the current study could be that the participants had more spare time during the lockdown, one reason for this being a decrease in time spent on travelling to and from their work place. This extra time

at home could have motivated them to intentionally take out some time from their daily schedule to exercise/work out or it could have just been that they saw this as a way to get some fresh air and not having to sit at home all day. These could be some of the many reasons why participants were found to engage in more physical activity in the current study.

Although on average physical activity increased during lockdown, only 29% believed they were more physically active during lockdown and 37% believed they were less active. As with eating behaviour, there seems to be a discrepancy between measured change and perceptions of change. Perhaps people tend to associate home confinement as having negative effects on exercising/working out regularly or their pre-lockdown physical activity levels may have had a role to play in their perceptions of how much physical activity they were engaging in during the lockdown when compared to before. For example, participants who had higher physical activity levels prior to the lockdown may tend to perceive that they were less active during the lockdown even when this may not be the case when their physical activity levels were measured.

Self-compassion, stress and health behaviours

One of the aims of this study was to examine the links between self-compassion, stress and the various health behaviours. It was observed that stress at both COVID-19 time points was significantly negatively correlated with self-compassion. This suggests that higher levels of self-compassion are related to lower levels of stress. This finding is consistent with previous literature that has indicated that stress and self-compassion are correlated. For example, a study that investigated the role of self-compassion on stress in women athletes found a negative correlation between self-compassion and stress levels (Mosewich et.al, 2019). Self-compassion was also found to have a positive association with eating behaviour, physical activity and PBC in the current study. This is consistent with previous research showing that higher levels of

self-compassion are related to higher engagement in health promoting behaviour (see Philips & Hine, 2019).

The current study also examined whether self-compassion had a role to play in terms of those who perceived change (increase or decrease) or no change in eating behaviour and physical activity. Results showed that those participants who had higher levels of self-compassion were found to be less likely to report any change in eating behaviour when compared to the participants with lower levels of self-compassion, both during and post lockdown . On the contrary, no such difference was found in perceived changes in physical activity during and post lockdown. Future studies may benefit by looking at the role self-compassion has on people's perception of their engagement in health behaviours.

This study also confirms previous research linking high stress levels and reduced engagement in healthy eating behavior (Hsu & Raposa, 2019; Jaaskelainen et al., 2014). Individuals reporting higher levels of stress during and after Alert Level 4 lockdown reported unhealthier eating behaviours and lower levels of perceived behavioural control over eating in the current study. But this was not the case with physical activity in this study. Stress was not found to be associated with level of engagement in physical activity despite some previous studies finding a negative association between stress and health behaviours (Kolehmainen & Sinha, 2013; Stanton et al., 2020). One plausible explanation for this could be that if the participants were habitually physically active or were in the habit of working out regularly, then being stressed or not may not have stopped them from maintaining their physical activity levels. Other extraneous factors could have also contributed to this discrepancy in finding.

The role of self-compassion in the link between stress and health behaviours.

The current study also aimed to examine the role of self-compassion as a predictor of health promoting behaviours when stress mediated this relationship. This study found some

support, consistent with previous literature (Homan & Sirois, 2017), for the mediating effect of stress on the relationship between self-compassion and health behaviours.

Stress was found to mediate the relationship between self-compassion and perceived behavioural control over eating, both during the lockdown and post lockdown in the current study. Higher self-compassion levels were related to lower stress levels, there by leading to increased perceived behavioural control.

But, for eating behaviour, the indirect effects of stress were significant only post lockdown. During the lockdown, stress was not found to mediate the relationship between self-compassion and eating behaviour. This finding is inconsistent with that of another study conducted by Li et al. (2019) which found that self-compassion positively predicted healthy eating when perceived stress mediated this relationship. This discrepancy in the findings could be due to the dropping out of participants from Time 1 to Time 2, which may have affected the mediation analyses.

Again, no mediation effect was found between self-compassion, stress and physical activity, both during the lockdown and post lockdown in the current study. This finding is in line with the study conducted by Li et al. (2019), which also found that stress did not mediate the relationship between self-compassion and physical exercise.

Having said that, though stress did not mediate the relationship between self-compassion and physical activity, this theory cannot be completely negated, considering this is the first study looking at self-compassion, stress and health behaviours during COVID-19 as per my knowledge. Future research looking at the relationship between these variables and considering the influence of other factors could prove useful and help gain an in depth understanding of the complicated nature of the interactions between the above-mentioned variables. One's intention regarding exercising regularly could be a cause of this finding. If

exercising is not considered as an important goal, then increased levels of stress may have no direct impact on the person's engagement in physical activity.

One of the aims of the current study was also to examine the moderating role of self-compassion in the relationship between stress and health behaviours. But the study found no support for the moderating role of self-compassion, despite some previous literature suggesting that people who had higher levels of self-compassion cope differently with stress, and there by proposing that self-compassion could have a moderating role in the relationship between stress and health promoting behaviours (Hu, Wang, Sun, Arteta-Garcia, & Purol, 2018).

In the current study, the link between stress and changes in eating behaviour, perceived behavioural control and physical activity were not affected by the level of self-compassion. Various factors may be responsible for this finding. For example, self-regulation is an important factor that has found to play a role in promoting engagement in behaviours that improve overall wellbeing in an individual. Self-regulation involves setting a goal, engaging in goal-directed behaviour, monitoring progress toward the goal, and adjusting one's behaviour when sufficient progress towards the goal is not being made (Baumeister & Heatherton, 1996). Hence, those who have healthier goals may be more likely to engage in healthier behaviours even under stress.

Health behaviour intention is another important factor that could have an influence on the relationship between self-compassion, stress and eating behaviour, physical activity and perceived behavioural control. For example, even if someone has high self-compassion levels, but their intentions with respect to healthy eating or exercising regularly are flawed and if they don't consider eating healthy and exercising as an important goal, then their behaviour may vary when under stress as compared to those with lower self-compassion levels.

Strengths

One of the major strengths of this study was its longitudinal design. This is the first study that has access to data collected before the start of the pandemic, and also the first study to assess eating behaviour, perceived behavioural control and physical activity at two time points post the pandemic (during the lockdown and post lockdown). All other studies are cross-sectional, single time points studies. Though these studies are helpful in understanding the associations between the various variables, longitudinal studies can be more beneficial by providing more insight into the nature of interactions between the different variables over a period of time. This is also the first study looking at the role of self-compassion and changes in health promoting behaviours during the COVID-19 pandemic.

Another strength of this study is that it used both mediation analyses and moderation analyses to examine the relationship between stress, self-compassion and engagement in health promoting behaviours. This can prove useful in terms of gaining a deeper understanding of the relationship between these variables. In this study, stress was found to mediate the relationship between self-compassion and eating behaviour at Time 2 but not Time 1 and it was also found to act as a mediating variable between self-compassion and perceived behavioural control at both Time 1 and Time 2 but did not act as a mediator between self-compassion and physical activity at both time points. This study also hypothesized that self-compassion moderated the relationship between stress and health behaviours. But, the results showed no moderation effect between stress and eating behaviour, PBC and physical activity when self-compassion was added as a moderating variable thereby revealing the complicated nature of the interaction between the different variables and therefore an emphasis on understanding this relationship in future studies could be beneficial.

Limitations

The dropout rates in participants from Time 1 to Time 2 may have affected the results of this study. The mediation and moderation effects tested in this study between self-compassion, stress and the different health promoting behaviours may have been impacted by this attrition bias. The participants who dropped out before the follow up could have been those who were more severely affected by the pandemic. These differences may have impacted the results of the current study.

Another limitation of this study was that most of the sample of this study were older people and female. These socio-demographic differences could have impacted the results of the study. For example, both eating habits and physical activity may vary from younger to older people. The extent to which the lockdown brought about changes in one's daily routine could also vary within different age groups. Future studies should aim at examining the differences in health behaviours and the role of self-compassion and stress across a wide range of age groups and in both males and females, for better generalizability of the current findings. Similarly, the sample of this study were all New Zealand residents. Future studies could look at comparing data from different countries to be able to generalize the findings to a larger population.

The role of other extraneous variables in the interactions between the various variables also need to be considered while interpreting the results. For example, the nature of COVID-19, the rules regarding lockdown, the time period of the lockdown, COVID related stressors and the extent to which the pandemic impacted various aspects of a person's life varied across sub-groups within the country and between different countries. Hence, future studies must identify these factors for better insight regarding the nature and direction of the relationships between self-compassion, stress and health promoting behaviours.

Another drawback of this study is the response bias. Participants may have made mistakes while answering the questions or lied about their responses to be able to produce desirable responses that the researcher is looking for.

Another limitation of this study was the use of a short-form scale (12 item) to measure self-compassion. This could have inhibited the in depth understanding of the various components of self-compassion- self-kindness, common humanity and mindfulness. For example, the isolated effect of a high score on the self-kindness aspect of self-compassion on changes in eating behaviour, perceived behavioural control and physical activity would not be able to be determined using the short form scale. The use of the original long form scale for self-compassion (Neff, 2003a) would allow these three components of self-compassion to be studied separately, which in turn would help understand the individual effects and strength of each of these components on health promoting behaviours.

Also, the time frame in which participants were asked to recall their eating behaviour (Baker, Little and Brownell 2003; see Kuijer & Boyce, 2015; Kuijer et al., 2015) was not consistent. The time frame at Time 0 differed slightly between the two parent studies (2 weeks in one study and 3 weeks in the other study) and at Time 1 and Time 2, a recall period of 4 weeks was used. This is another shortcoming of this study that needs to be taken into account in the future.

Implications and Scope for Future Research

Though this study found mostly positive effects of self-compassion on health promoting behaviours, the complicated nature of the role of self-compassion in health-related outcomes should not be ignored. There are a few studies which found self-compassion to be a negative predictor of health promoting behaviours. For example, a study by Levin, Dalrymple & Zimmerman (2014) which looked at the relationship between mindfulness and risky alcohol

use suggested that mindfulness need not always be a protective factor, rather it could be a positive predictor of risky alcohol use. According to them, this relationship may not be straight forward and could be predicted by various other factors. Mindfulness is one of the core components of self-compassion and is made of several other facets (nonjudging, awareness etc.) and hence, the presence of these factors in varying levels could be responsible for the overall impact mindfulness has on risky alcohol use. For example, an increase in the nonjudging facet of mindfulness or decreased judgement of one's experiences could lead to a more forgiving attitude when faced with negative consequences of indulging in a risk behaviour which in turn may lead to continued engagement in that particular behaviour.

Similarly, the self-kindness component of self-compassion may also have a negative effect on eating behaviour and physical activity (Sullivan, Kerr & Kuijer, 2018). Treating yourself to unhealthy food or sweets because you had a stressful day is an example. This behaviour, when repeated regularly, may be harmful.

As mentioned previously, there is no research on the role of self-compassion on health behaviours during COVID-19. Hence, more research focusing on identifying this fine line between being self-compassionate versus being overly compassionate towards oneself is needed to gain a deeper understanding of the impact self-compassion may have on a person's health outcomes, both physical and mental health. Further research to understand the relationship between stress and self-compassion, specifically looking at COVID related stressors and its association with self-compassion may be beneficial. Similarly, more longitudinal studies understanding the role of both trait and state self-compassion on both health risk behaviours and health promoting behaviours during a pandemic could be useful in being able to design self-compassion interventions which in turn could have a huge positive impact on health outcomes and overall wellbeing.

Future studies using more objective measures need to be done. More studies using experimental designs that involve the administering of self-compassion interventions to be able to examine the relationships between the various variables should be done. Studies should also probe further to examine the moderation effects of self-compassion on the relationship between stress and health promoting behaviours.

Conclusion

Overall, the present study found that stress, self-compassion and health promoting behaviours such as eating behaviour, perceived behavioural control and physical activity were correlated at all three time points. It was evident from this study that higher levels of self-compassion were associated with lower levels of stress, both during the lockdown and post lockdown. Higher levels of stress were also found to be related to a decrease in healthy eating behaviour and reduced perceived behavioural control but this effect was not significant for physical activity. Future studies should focus on exploring this relationship using more objective measures.

On examining the mediating effect of stress on the relationship between self-compassion and health behaviours, this study found that higher levels of self-compassion were related to lower levels of stress and that in turn was associated with healthier eating behaviour post lockdown. This effect was not significant during the lockdown. Similarly, stress was also found to act as a mediator between self-compassion and perceived behavioural control both during and post lockdown but this mediating effect was not significant for physical activity at both time points.

Moderation effects of self-compassion levels on the relationship between stress and health behaviours were also determined in this study. Though significant effects were expected,

self-compassion did not moderate the relationship between stress and eating behaviour, PBC and physical activity.

More studies that examine this relationship using more accurate measures that focus on understanding self-compassion may be insightful. Diary studies could also be done as a means to gain an in depth understanding of the role of self-compassion on health behaviours. The current global crisis due to the COVID-19 pandemic has posed major health risks. Therefore, determining the associations between self-compassion, stress and health promoting behaviours can be a breakthrough in the field of health care. By developing self-compassion interventions and teaching people ways to cope with stress and improve their engagement in health promoting behaviours, an overall increase in wellbeing can be achieved.

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Appendix A : Ethics Approval



HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson Telephone: +64 03 369 4588, Extn 94588 Email: human-ethics@canterbury.ac.nz

Ref: HEC 2020/24 17 April 2020

Associate Professor Roeline Kuijer Psychology, Speech and Hearing UNIVERSITY OF CANTERBURY

Dear Roeline

The Human Ethics Committee advises that your research proposal “Health and Well-being Research: Coping with the COVID-19 Situation” has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 17th April 2020.

Best wishes for your project. Yours sincerely

Dr Dean Sutherland

Chair
University of Canterbury Human Ethics Committee

A handwritten signature in black ink, appearing to be 'DS', written in a cursive style.

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand.
www.canterbury.ac.nz

Appendix B: Information sheet

Health and Well-being Research: Coping with the COVID-19 situation

You are receiving this email because you recently participated in one of our studies looking at Health, Well-being and Health Behaviour and indicated that you would be happy to be contacted about future research.

We would like to invite you to participate in our study looking at how people are coping with the COVID-19 situation. Our aim is to follow a sample of New Zealanders over the next 3 months and examine how the COVID-19 situation impacts on their health, well-being and health behaviours (such as your eating behaviour, your physical exercise). If you are interested, please read the information below.

Information sheet

What does participation involve?

Participation involves completing an online survey every two weeks for the next 3 months (7 surveys in total). In these surveys we will ask you about your well-being, mood, and health. We will also ask some questions about health behaviours (your eating behaviour, physical exercise, smoking and alcohol use), COVID-19 related stressors, changes in employment, and your home situation (e.g., whether you have children at home who now need to engage in online learning).

The first survey will take around 20 minutes to complete. The other surveys will all be shorter varying from 5-10 minutes for the 2nd, 4th and 6th survey (they will just be a quick update on how you have been) to around 15 minutes for the 3rd, 5th and last survey. Participants who complete the 7 surveys will receive a \$20 supermarket voucher as a small token of our appreciation for completing the study and will go into a draw to win one of three \$100 supermarket vouchers.

What happens to the information I provide?

The results of the study may be published, but you may be assured of the complete confidentiality of the data gathered in this study. We will not ask for any identifying information in the questionnaires. When you first participated in one of our studies you were assigned an identification code. This code is linked to your email address so that we can send out new surveys.

Data will be stored in a secure office in the School of Psychology, Speech and Hearing at the University of Canterbury. Only the researchers will have access to the data. It is possible that future students will use (some of) the data for their research projects. However, these students will not have access to any identifying information. The data will be stored securely for 10 years following the completion of the project and will then be destroyed.

Participation is voluntary and you have the right to withdraw from the study at any point. If you withdraw, we will remove all information you have provided.

Are there any risks involved?

It is not anticipated that participation in this study will pose any risk. The questionnaires have been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch, New Zealand (human-ethics@canterbury.ac.nz).

If at any point you do not wish to continue your participation in the study, simply exit the survey and your responses will not be recorded. **If you are concerned about health issues** we suggest you contact your general practitioner, or phone the Healthline (0800 358 5453) or the Government COVID-19 helpline (0800 779 997) for advice.

The Unite Against COVID-19 website from the New Zealand Government (<https://covid19.govt.nz/help-and-advice/for-everyone/>) provides helpful advice on how to look after your **mental well-being** during these challenging times. If you feel you are not coping it is important to talk with a health professional. For support, grief, anxiety, distress or mental well-being, you can call or text **1737 call or text 1737** – free, anytime, 24 hours a day, 7 days a week – to talk with a trained counsellor.

This research is carried out by Associate Professor Roeline Kuijer who works at the School of Psychology, Speech and Hearing at the University of Canterbury. She can be contacted at roeline.kuijer@canterbury.ac.nz and will be pleased to discuss any questions or concerns you might have about participation in the project.

What next?

If you are willing to participate please click on the link below to access the first survey. If possible, please complete the survey within the next few days (preferably before April the 23rd).

Your participation is very much appreciated.

Sincerely,
Associate Professor Roeline Kuijer

Appendix C: Self-compassion & Stress

Self-Compassion Scale (Time 0)

(Raes et al., 2011)

Please read each statement carefully and answer with the following scale:

	Almost never	Rarely	Sometimes	Often	Almost always
When I fail at something important to me I become consumed by feelings of inadequacy	<input type="radio"/>				
I try to be understanding and patient towards those aspects of my personality I don't like	<input type="radio"/>				
When something painful happens I try to take a balanced view of the situation	<input type="radio"/>				
When I'm feeling down, I tend to feel like most other people are probably happier than I am	<input type="radio"/>				
I try to see my failings as part of the human condition	<input type="radio"/>				
When I'm going through a very hard time, I give myself the care and tenderness I need	<input type="radio"/>				
When something upsets me, I try and keep my emotions in balance	<input type="radio"/>				
When I fail at something that's important to me, I tend to feel alone in my failure	<input type="radio"/>				
When I'm feeling down I tend to obsess and fixate on everything that's wrong	<input type="radio"/>				
When I feel inadequate in some way, I try and remind myself that feelings of inadequacy are shared by most people	<input type="radio"/>				
I'm disapproving and judgemental about my own flaws and inadequacies	<input type="radio"/>				
I'm intolerant and impatient towards those aspects of my personality I don't like	<input type="radio"/>				

Stress: Time 1 and Time 2

(Parks et al., 2012)

All things considered, how stressful has your life been in the past 4 weeks ?

- 1 = "Not stressful at all"
- 2 = 2
- 3 = 3
- 4 = 4
- 5 = 5
- 6 = 6
- 7 = 7
- 8 = 8
- 9 = 9
- 10 = "Extremely stressful"

Appendix D: Lifestyle behaviours

Eating behaviour: Time 0, Time 1 and Time 2

(based on Baker, Little & Brownell, 2003; see Kuijer & Boyce, 2015; Kuijer et al., 2015)

In the past 4 weeks, on how many days per week did you

	every day	on 5 or 6 days/week	on 3 or 4 days/week	on 1 or 2 days/week	less than once a week
eat healthy amounts of food (not too much or too little)	O	O	O	O	O
eat in a balanced way with a lot of fruit and vegetables	O	O	O	O	O
eat sweet snacks (e.g., sweets, candy bars, chocolate, biscuits)	O	O	O	O	O
eat savoury snacks (e.g., potato chips, corn chips)	O	O	O	O	O
overeate (kept eating while you were already full)	O	O	O	O	O
eat ready-to-eat convenience meals (e.g., meat pies, pizza, canned spaghetti, tv-dinners)	O	O	O	O	O

Perceived Behavioural Control

(based on Armitage, 2005; see Kuijer & Boyce, 2015; Kuijer et al., 2015)

How difficult or easy are the following things for you at the moment?

	Very Difficult	Difficult	Neutral	Easy	Very Easy
eating in a balanced way with a lot of fruit and vegetables	O	O	O	O	O
eating moderate amounts of food and stopping when I am full	O	O	O	O	O
staying away from sweet snacks (e.g., sweets, candy bars, chocolate, biscuits)	O	O	O	O	O

staying away from savoury snacks (e.g., potato chips, corn chips)	<input type="radio"/>				
staying away from eating ready-to-eat convenience meals (e.g., meat pies, pizza, canned spaghetti, tv-dinners)	<input type="radio"/>				

Self-reported change in eating behaviour: Time 1 and Time 2

Has your eating behaviour in lockdown been different from normal?

- I normally eat less healthy
- I normally eat more healthy
- About the same

Physical activity: Time 0, Time 1 and Time 3

(New Zealand Health Survey; Ministry of Health)

The following questions are about the time you spent being physically active. By 'active' we mean doing anything using your muscles. Think about activities for work, school or home, getting from place to place, and any activities you did for exercise, sport, recreation or leisure.

During the last 4 weeks, on how many days per week did you get 30+ minutes of moderate physical activity? Moderate activities make you breathe harder than normal, but only a little, like carrying light loads, brisk walking, or bicycling at a regular pace,

- 0 days
- 1 day
- 2 days
- 3 days
- 4 days
- 5 days
- 6 days
- 7 days

During the last 4 weeks, on how many days per week did you get 20+ minutes of vigorous physical activity? Vigorous activities make you breathe a lot harder than normal ("huff and puff") - like heavy lifting, digging, aerobics, fast bicycling

- 0 days
- 1 day
- 2 days
- 3 days
- 4 days
- 5 days
- 6 days
- 7 days

Self-reported change in eating behaviour: Time 1 and Time 2

Have your physical activity levels been different from normal?

- I am normally less physically active
- I am normally more physically active
- About the same